

ALCOR LIFE EXTENSION FOUNDATION

# CRYONICS

FOCUS ON CRYOPRESERVATION TODAY

SPRING 2006 · VOLUME 27:2

COVER STORY: PAGE 7

## ADVANCES IN CRYOPRESERVATION

DR. GREGORY M. FAHY

ALCOR'S 6<sup>TH</sup>  
CONFERENCE      PAGES 5 - 6

HUMAN  
CRYOPRESERVATION  
STABILIZATION  
MEDICATIONS

PAGES 9-11

TRACKING CASELOAD  
TRENDS      PAGES 13-14



ISSN 1054-4305 • \$10.00

# The 6<sup>th</sup> Alcor Conference

AN INSIDE LOOK AT THE SCIENCE AND  
MEDICINE OF TOMORROW

Is it possible to live to 1000 years of age or beyond? Will nanomedicine and medical nanorobots dramatically extend the human lifespan? Can cryopreserved organs and human beings be revived in the future? Join us and members of our community to hear distinguished speakers present their provocative insights into where we are today and what's possible tomorrow in anti-aging, life extension research, nanotechnology, organ preservation, cryonics and more.



Organized by the Alcor Foundation,  
a non-profit cryonics organization  
founded in 1972 with the mission of  
*The Preservation of  
Individual Lives*

Register Online  
[www.alcor.org](http://www.alcor.org)



**October 6-8, 2006**

Scottsdale Marriott at McDowell  
Mountains in Scottsdale, Arizona  
[www.scottsdalemarrriott.com](http://www.scottsdalemarrriott.com)

For more information or to  
register online please visit:  
[www.alcor.org](http://www.alcor.org)

**Early Registration ends  
August 1<sup>st</sup>**



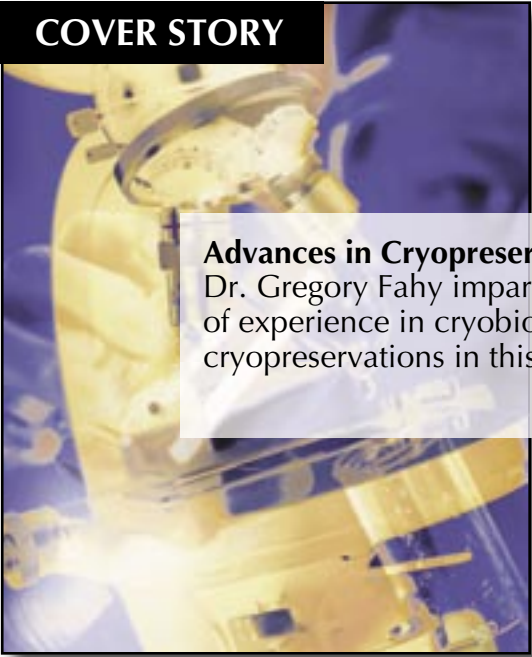
877-462-5267 x 113 • fax 480-922-9027 • email: [Jennifer@alcor.org](mailto:Jennifer@alcor.org)  
7895 E. Acoma Drive, Suite 110, Scottsdale, AZ 85260

# CRYONICS

SPRING 2006 • VOLUME 27:2

## FOCUS ON CRYOPRESERVATIONS TODAY

### COVER STORY



**Advances in Cryopreservation:**  
Dr. Gregory Fahy imparts 30 years of experience in cryobiology and cryopreservations in this new feature.

PAGE 7

**5 Alcor's 6<sup>th</sup> Conference:**  
Register for a weekend of dynamic speakers offering the latest in whole-body vitrification, anti-aging and life extension research, nanotechnology, and more.

**9 Human Cryopreservation Stabilization Medications:**  
Aschwin de Wolf, Alcor Certified Technician, reveals how certain medications determine the success of a cryopreservation and explains their roles in conventional medicine.

**13 Tracking Caseload Trends:**  
A critical look at the potential impact of peak demands on cryopreservation cases.

**18 Tech News:** Doctors claim suspended animation success and other recent advancements in electronics, quantum computing, and medicine.



## INSIDE CRYONICS

**2 From the Editor**

**3 Executive Director's Report:** The outlook on whole-body vitrification research, some challenging cryopreservation cases and all the attention Alcor is getting from major media outlets.

**4 Book Review: *The Singularity Is Near:*** Technological advancements may enhance human intelligence. But will they happen fast enough?

**12 Learn More Online:** Alcor's website displays how cryopreservation medications are transported from state to state.

**15 Member Profile:** Meet Beth Bailey, a forward-thinking member of Alcor.

**16 Case Summary:** Cryopreservation of A-1097

**20 Alcor Meetings:** Information for becoming more active in your local cryonics group.

**Editor**

Jennifer Chapman

**Art Director**

Dorothy Wolden

**Contributing Writers**

Jennifer Chapman, Aschwin de Wolf,  
Gregory M. Fahy, Ph.D., Tanya Jones,  
R. Michael Perry, Ph.D., Stephen Van Sickle

**Contributing Photographers**

Charles Platt

Copyright 2006

by Alcor Life Extension Foundation

All rights reserved.

Reproduction, in whole or part, without  
permission is prohibited.

*Cryonics* Magazine is published quarterly.

To subscribe: call 480.905.1906 ext. 101

Address correspondence to:

*Cryonics* Magazine

7895 East Acoma Drive, Suite 110

Scottsdale, Arizona 85260

Phone: 480.905.1906

Toll free: 877.462.5267

Fax: 480.922.9027

Letters to the Editor welcome:

[jennifer@alcor.org](mailto:jennifer@alcor.org)

Advertising inquiries:

480.905.1906 ext. 113

ISSN: 1054-4305

Visit us on the web at [www.alcor.org](http://www.alcor.org)

## FROM THE EDITOR

The science of cryonics is constantly moving forward. Not only through the efforts of Alcor, but scientists around the globe are exploring the use of extreme cold to benefit mankind. This issue of *Cryonics* focuses on a variety of scientific aspects of cryopreservation.

We are proud to welcome distinguished researcher Dr. Gregory M. Fahy who begins a regular column on cryobiology and cryopreservations, "Advances in Cryopreservation." His front line experiences—and his ability to clearly explain complex scientific findings—will bring our readers the very latest breakthroughs and advances.

Aschwin de Wolf, a member of Alcor's emergency response team, explains the rationale of Alcor's cryopreservation medications and how they compare to uses in conventional medicine. For example, it is not uncommon for doctors to prescribe many of the same medications that are critical to a successful cryopreservation. Ask a doctor why heparin is used and the response is likely to be that it decreases the clotting ability of the blood and prevents harmful clots from forming, such as during heart bypass surgery. Preventing blood clots is a vital first step in a cryopreservation case, since the circulatory system must remain unobstructed for additional medications and subsequent cryoprotective perfusion.

Readers may be interested in knowing about Alcor's ability to handle cryopreservations as our membership grows. If Alcor has two or three times as many members, what is the possibility of being faced with two or more cryopreservations within the same day? Dr. R. Michael Perry, who has a B.S. in mathematics and a Ph.D. in computer science, undertook the challenge of scrutinizing the consequences of success. Tracking these trends as Alcor grows gives insight into the preparations necessary to sustain our expected caseload.

If you want to hear personally from world-renowned experts in the field of cryonics and related subjects—we encourage you to register early for the upcoming Alcor Conference.



**Early Registration is now open for Alcor's October 2006 conference in Scottsdale, Arizona. See pages 5-6 for more details and check our website for regular updates.**

# EXECUTIVE DIRECTOR'S REPORT

## Whole-Body Vitrification Research

Due to the generous donations of over 80 individuals, we fully achieved our \$200,000 goal for whole-body vitrification research. Our sincere appreciation goes out to each of you and especially to Bina and Martine Rothblatt who matched each of your donations dollar-for-dollar. These donors gave permission for public acknowledgement:

Steve Anderson	Mark Kaminsky
Doug & Shirley Arends	Terry Katz
Howard Baetjer	Eugene Kusmiak
Kevin Brown	Larry Lee
Honor Bulkley	David Levine
James Clement	Thomas McKendree
Andrew Clifford	Thomas Meyer
Brian Climo	John Munson
Kat Cotter	Martin Olah
Daniel Crevier	Robert Revitz
Bobby Ford	Dennis Ross
Cornelius Freer	Edward Thorp
Erik Hatfield	Andrea Van de Loo
Graham Hipkiss	Charles Young

The research funds are already going to good use. In the last few months our Chief Research Scientist, Dr. Sergey Sheleg, tested the LESA fiber optic spectrofluorometer using the photosensitizer drug Photosens. Photosens appears to be a very useful agent for measuring cerebral circulation and can be used for testing different protocols related to improving perfusion in the brain during cryonics procedures. Dr. Sheleg is also penning multiple scientific papers for publication.

## Cryopreservation Report

Tempering the excitement of groundbreaking research is the difficulty of cryopreserving people you have known for many years. Three members of Alcor were cryopreserved thus far in 2006, all of whom were long-time members. Two were known personally by several staff members. We will miss them and, as with all patients, our sympathies go out to their families.

While on the topic of cryopreservation cases, I'd like to take this opportunity to mention a case that occurred last year. A-2172 was an elderly, wealthy man whose relatives contacted Alcor when he was comatose and unable to actively choose cryonics for himself. He had left no directive expressing a wish for (or against) cryopreservation. His legal death and pro-

nouncement occurred in the early morning of May 19, 2005, when the paperwork had been partly but not fully executed. Despite serious disagreement within the Board of Directors, the decision was made to proceed immediately with the cryoprotection and cooldown to dry ice temperatures to minimize any deterioration.

But at this point the family, most of whom spoke little or no English, indicated they had misunderstood the nature of cryonics and now wished to withdraw the patient from the procedure. They executed paperwork which affirmed their decision and released Alcor from liability. The patient was released to a mortuary in accordance with the family's decision on May 27. This unfortunate incident underscores the need for prospective donors to complete their arrangements for cryoprotection themselves.

## Alcor Conference

This October, when the desert weather is enjoyable, will be the ideal time to bring Alcor and science enthusiasts together. The conference is sure to be full of interesting talks, both from behind the podium and around the dinner table, not to mention alongside the swimming pool. Our website ([www.alcor.org](http://www.alcor.org)) provides all the conference details and a link to the registration page. Early registration of \$295 ends August 1<sup>st</sup>. Please join us.

## International Media Coverage

Did you ever think you could turn on your morning show or nightly news and hear what is going on at Alcor Foundation? That, indeed, is the trend lately. In January, a piece about Alcor aired on ABC's "Good Morning America" and a few months later a segment was videotaped for CNN's "Anderson Cooper 360". Alcor's Chief Operating Officer, Tanya Jones, just finished an interview with Barbara Walters for a special about life extension set to air on ABC in 2007. If you missed any of these broadcasts, check the News Media section of our website ([www.alcor.org/press/newsstories.html](http://www.alcor.org/press/newsstories.html)) for available footage.

## Alcor's Future

Slowly but surely a new day is dawning for Alcor. Our dedicated staff has been diligently working to develop sustainable plans for Alcor's future. Stay connected by subscrib-



ing to Alcor News, our free electronic newsletter ([www.alcornews.org](http://www.alcornews.org)), and networking with other Alcor members on AlcorUnited ([www.alcorunited.org](http://www.alcorunited.org)).

Sincerely

Stephen J. Van Sickle  
Executive Director

Contact the author: [stevevs@alcor.org](mailto:stevevs@alcor.org)



Tanya Jones, Alcor COO, Barbara Walters and her producer discuss details for videotaping the next segment in the new Patient Care Bay.

# THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY

By Ray Kurzweil ~ London: Viking Penguin, 2005

## BOOK REVIEW BY R. MICHAEL PERRY, PH.D.

Ray Kurzweil is a well-known technology-oriented inventor and futuristic forecaster whose previous books include *The Age of Intelligent Machines*, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*, and (with Terry Grossman) *Fantastic Voyage: Live Long Enough to Live Forever*. The last title says much about his orientation to life, an outlook which also informs his latest book, *The Singularity is Near*.

Kurzweil is an immortalist who hopes human life will be greatly extended and enhanced through means now being developed. In his latest book, he discusses his hope to “catch the wave” of this advancing technology to personally experience the new life it should enable. The “wave” itself will mushroom to a “Singularity” where computers are smarter than present-day humans and benefits abound. Among the benefits will be the liberation from biological limits on life span.

By then, says Kurzweil, the world will be complex indeed, however, increases in human intelligence will have also occurred, enabling humans to continue to comprehend the world around them. People thus will not stay the same but become “enhanced humans,” keeping their humanity in the positive ways, yet acquiring greater talents along with becoming virtually indestructible. Since this will be available to people generally a personal wish for immortality can be linked to more general humanitarian concerns and need not at all be improperly “selfish,” as naysayers sometimes allege.

But for those living today enough progress must occur in a time window of at most a few decades to prevent aging and diseases from taking their toll. The older and less healthy one is, the more urgent is the need for fast progress. (Kurzweil himself is in his late 50s and diabetic). It is Kurzweil’s premise that progress will likely be fast enough to save him and many others, and he bolsters his case with an extended analysis of technological growth.

Technology is now dominated increasingly by information processing. According to Kurzweil, progress in various aspects of computer

performance shows reassuring exponential growth rates in various measures of performance, one being amount of computation per unit cost of computing. Actually, in this case, the trend is faster than expected: computation speed doubled every three years in the early part of the 20th century, but now doubling happens every one year, so it appears that actually a faster, double-exponential rule is at work. Many other indicators of progress both in and outside the field of computing show at least exponential growth, as charts lavishly illustrate, so there is some serious ground for optimism. It is interesting

---

*“It is Kurzweil’s premise that progress will likely be fast enough to save him and many others.”*

---

that natural evolution, the slower prologue of the human technological variety, also fits the exponential rule when interpreted in terms of various reasonable “paradigm shifts.” More generally progress gets “smarter” and accelerates even when not consciously directed.

Kurzweil views time extending from remote prehistory into the future as comprising six epochs of progress, each an outgrowth of its predecessor: (1) physics and chemistry, (2) biology and DNA, (3) brains, (4) technology, (5) the merger of human technology with human intelligence, (6) “the universe wakes up.” The first three of these predated the appearance of humankind and required many millions of years. Epoch four, human-driven technology, really started with protohumans several million years ago chipping stone tools, but quickened when near-modern humans emerged a few hundred thousand years ago. The acceleration in progress from then to now is particularly striking, considering that almost all this time was occupied by the Stone Age.

Comparatively speaking, writing, mechanical printing, the industrial revolution, and automated computing have led up to the present technological blizzard with its promise of much more to come in a relative eyeblink. Epochs five and six are yet to occur. But epoch five at least, and our deliverance from ag-



Ray Kurzweil

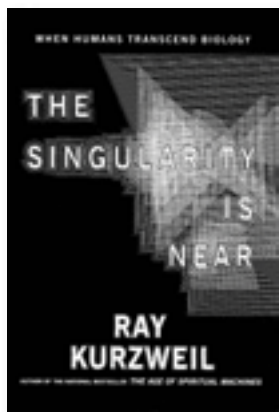
ing-induced mortality and other biological limitations, should only take a few more decades.

The problems that must be solved for this all-important, penultimate step are formidable, however, and the “few more decades” could still be too many to save most of us now living. So it is not surprising that Kurzweil’s enthusiastic forecasting has inspired a backlash of controversy; some fifty pages of his ample work are devoted to answering critics. In particular scientists often discount the idea of fast progress because they do not perceive the exponential or superexponential character of many of our advances, which are interconnected so that rates of progress are mutually reinforcing. Others are afraid of the harm that misapplied technology could cause (as in terrorism); but Kurzweil is optimistic that the good will outweigh the bad, a trend which should intensify as more and bigger benefits are had by more and more people.

The main text of the large, sprawling volume is interrupted by many charts and sidebars, and an ongoing, fictional dialogue which thrashes out the various viewpoints and contentions that come up. Informative, yes, and also entertaining—but some may find it distracting. Overall, though, the book has been selling well, suggesting many are taking its views seriously. It is certainly a relief from the dreary pronouncements of “humanist fundamentalists” and others who would have us remain as we are biologically, and who even question our right to choose as progress makes life-enhancing changes possible.

For the reader who is looking for any mention of cryonics—it is only brief and rather off-handed—in connection with the philosophical problems posed by the possibility of duplicating people in the future. (Some cryonics resuscitation scenarios raise this sort of issue.) Since the topic of cryonics is treated non-judgmentally, a newcomer to the subject of cryonics will hopefully be inspired to inquire further. ■

Contact the author: [mike@alcor.org](mailto:mike@alcor.org)



# The 6<sup>th</sup> Alcor Conference

## IN BEAUTIFUL SCOTTSDALE, ARIZONA



### SPEAKERS FROM AROUND THE WORLD

**Aubrey de Grey, Ph.D.**  
Geneticist, Cambridge University  
*SENS: A Precursor to  
Cryonic Revival*



**Gregory Fahy, Ph.D.**  
Cryobiologist, Chief Scientific  
Officer, 21<sup>st</sup> Century Medicine  
*Research Toward  
Suspended Animation*



**Robert A. Freitas Jr., JD**  
Nanomedicine researcher,  
Senior Research Fellow, Institute  
for Molecular Manufacturing  
*Nanomedicine: What, When  
and How?*



**David Friedman, Ph.D.**  
Economist, Professor of Law  
Santa Clara University  
*Economics of Radically  
Extended Life*



### CRYONICS PUBLIC POLICY PANEL



Arizona State  
Representative  
**Linda Lopez**



Alcor Lobbyist  
**Barry Aarons**



Arizona State  
Representative  
**Michele Reagan**

### MORE SPEAKERS TO BE ANNOUNCED!

Visit [www.alcor.org](http://www.alcor.org) for full conference details  
or call 877-462-5267 x 113

Register Online  
[www.alcor.org](http://www.alcor.org)

### 6<sup>th</sup> ALCOR CONFERENCE: An Inside Look at the Science and Medicine of Tomorrow

**OCTOBER 6-8, 2006**

Scottsdale Marriott at McDowell Mountains

#### Conference Fee:

#### Register between

May 1 - August 1 .....\$295  
August 2 - August 31 .....\$395  
September 1 - October 6 .....\$495

#### Conference Schedule:

Friday Welcome reception  
Saturday Speaker presentations  
followed by dinner  
Sunday Half-day speaker  
presentations followed by  
barbeque & tours at Alcor

# The 6<sup>th</sup> Alcor Conference

AN INSIDE LOOK AT THE SCIENCE AND MEDICINE OF TOMORROW

Registration includes conference materials, continental breakfast, breaks, luncheon and evening receptions.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

E-mail \_\_\_\_\_

Home Phone \_\_\_\_\_

How I heard about the 6<sup>th</sup> Alcor Conference: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Include me on the public attendee list:  Yes  No      Vegetarian  Yes

Payment Method:  Check     Credit Card (Visa, MasterCard, American Express)

Credit Card \_\_\_\_\_ Expiration \_\_\_\_\_

CVS Number\* \_\_\_\_\_

*\*Visa and MasterCard: 3 digit number on back of card at end of the long string of numbers  
American Express: 4 digit number on front of card above card number on right side*

Name on Credit Card \_\_\_\_\_

Signature \_\_\_\_\_

Make check payable to Alcor Foundation and mail to:

Alcor Foundation  
7895 E. Acoma Drive, Suite 110  
Scottsdale, AZ 85260

Or fax form to: 480-922-9027

Registration Questions?  
Contact Connie Gutierrez at 480-990-1887  
or [connie@mcsourcenet](mailto:connie@mcsourcenet)  
Visit [www.alcor.org](http://www.alcor.org) for full  
conference details

ADA ACCOMMODATIONS: Persons with a disability may request a reasonable accommodation by contacting Connie Gutierrez of Meetings & Concierges Source LLC at 480-990-1887 or at [connie@mcsourcenet](mailto:connie@mcsourcenet). Requests should be made by September 15, 2006, to allow time to arrange for the requested accommodation.

HOTEL ACCOMMODATIONS: Scottsdale Marriott at McDowell Mountains offers a special group room rate of \$169. Cut-off date for this special rate is 9/14/06. Please contact Marriott Reservations at 800-288-6127 to make reservations. For more information on the Scottsdale Marriott at McDowell Mountains, please visit [www.scottsdalemarrriott.com](http://www.scottsdalemarrriott.com)

Registration



# ADVANCES IN CRYOPRESERVATION

By Gregory M. Fahy, Ph.D., Chief Scientific Officer, 21<sup>st</sup> Century Medicine, Inc.



Courtesy FreeNaturePictures.com

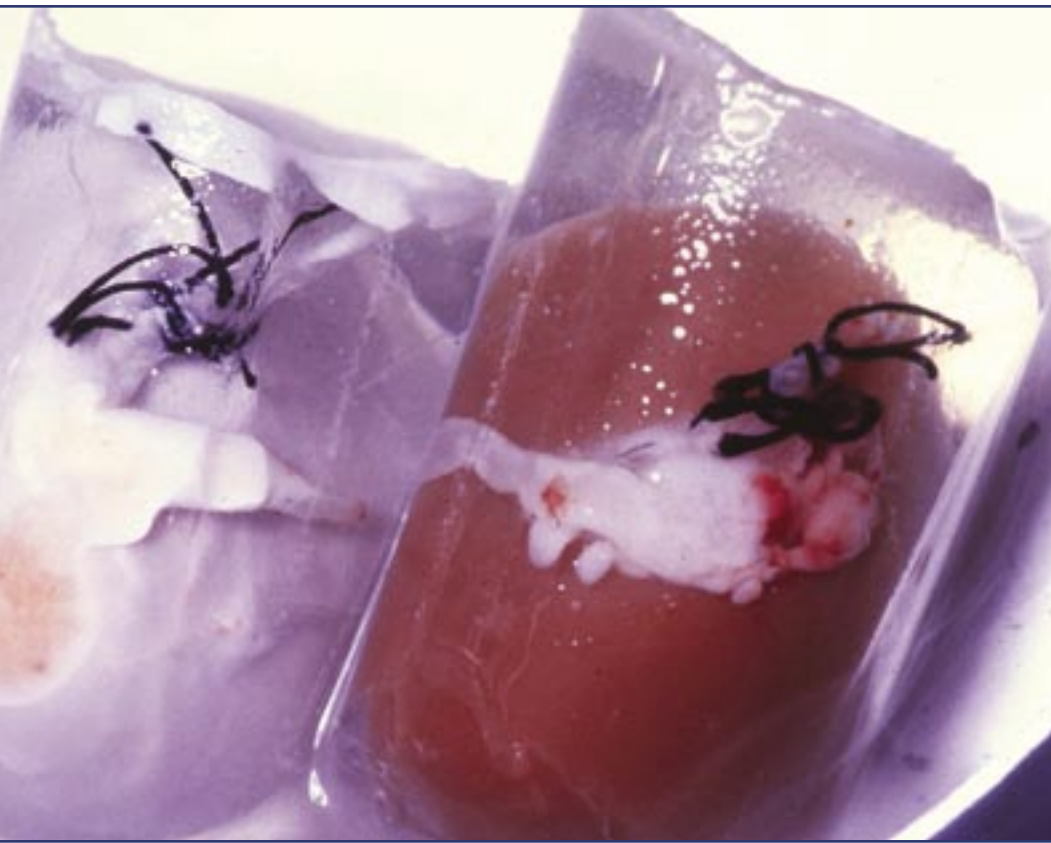
*Vitrification avoids the damaging side effects of freezing.*

This new column is intended to focus on the science of cryobiology and cryopreservation, and particularly to highlight important advances in these fields. In this inaugural installment, we'll take a brief look at the broad sweep of cryobiology and its accomplishments, as well as its shortcomings to date.

“Cryobiology” is a term apparently coined by Sir Alan S. Parkes [1], one of the authors of a pivotal and classic paper that in many ways launched the modern era of cryobiology by showing that agents such as glycerol could protect living systems that would otherwise be killed by cooling to low temperatures [2]. According to Dr. Parkes, his colleagues, Dr. Audrey Smith and Dr. James Lovelock, also giants in the history of cryobiology, objected to Parkes' combination of the Greek work “Kruos” (for frost) with “biology” to describe the field of “frosty life.” He pointed to precedents such as “cryogen,” “cryostat,” and “cryophilic,” but Dr. Smith disliked the coining of new words in principle and Dr. Lovelock deplored the development of scientific jargon. Fortunately, Dr. Parkes won the day, and the term

“cryobiology” was finally used in the scientific literature in 1958 [3], and the first issue of the journal “Cryobiology” was published at the end of 1964.

Even from the beginning, cryobiology was considered to be a term that could cover more than just the study of the effects of freezing and thawing on living systems, including hypothermia, for example [1]. The field has grown to encompass any phenomenon related to life at temperatures below the norm for a given species, including the death of certain plants and animals cooled to temperatures above the freezing point of water, the storage of mammalian organs surrounded by melting ice, the study of membrane phase transitions (freezing of fatty materials in the boundary between the cell and its environment), and the vitrification of living systems, in which the cryogenic temperatures used for long term storage of frozen systems are used without the damaging side effect of freezing (rearrangement of water molecules into ice crystals). The first issue of “Cryobiology” dealt with the freezing of microorganisms, plants, and medically important cells such as



Frozen (left) and vitrified (right) rabbit kidneys immersed in glassy cylinders of the perfusate used to perfuse the kidney on the right. The kidneys were photographed at minus 140 degrees Celsius after removing the containers in which they were originally cooled.



Dr. Fahy received his Ph.D. in 1977 at the Department of Pharmacology at the Medical College of Georgia, specializing in mechanisms of freezing injury in cells and tissues and in the pursuit of alternatives to freezing. He joined the American National Red Cross in 1977, and in 1980 conceived of the idea of vitrifying whole organs as a solution to the problems created by ice formation. He has pursued this concept to the present day and is now the Chief Scientific Officer of 21<sup>st</sup> Century Medicine, a company dedicated to solving the most difficult problems of applied cryobiology.

bone marrow cells and red blood cells, but also included a paper by a cryosurgeon using freezing and thawing as a way of deliberately destroying living tissue.

Cryobiologists have been able to successfully preserve the viability of most of the cells in the human body in isolation by freezing, and it is also possible to preserve simple tissues and sometimes not-so-simple tissues using relatively unsophisticated freezing techniques. But when the system becomes thick enough to require support by a blood supply immediately after thawing and transplantation, the deficiencies of freezing become more obvious in part because damage to blood vessels begins to be a problem.

Despite vascular damage caused by the development of rock-like grains of ice in living tissues, amazing feats have been attained, including the survival of a minority of segments of dog small intestine after freezing in liquid nitrogen and subsequent transplantation [4], and even the recovery of hamsters after superficial whole body freezing [5]. Nevertheless, most cryobiologists are coming around to the point of view that if one wants to be able to bank most whole organs and “bring them back alive”

in a truly satisfactory state of health, the old freezing paradigm is not the way to go.

Instead, vitrification, which literally means “glass formation,” is an approach to cryopreservation that can theoretically preserve living systems of arbitrary complexity and size because of its ability to eliminate the physical injury to blood vessels and other structures caused by the development of ice crystals that can push against these structures and literally tear them at least partially apart. The photograph (modified from [6]) shows that vitrification can be accomplished on the size scale of rabbit kidneys (about 10 milliliters), and the vitrification of volumes up to 2 liters has also recently been experimentally demonstrated [7].

Ice formation can develop forces strong enough to split open rocks, so it is logical that preventing freezing by using vitrification is developing into a safer way to approach the problem of whole organ cryopreservation [8]. But that is a topic for another time.

## References

1. Parkes, A.S., *Cryobiology*. *Cryobiology* 1 (1964) 3.

2. Polge, C., A.U. Smith, and A.S. Parkes, *Revival of spermatozoa after vitrification and dehydration at low temperatures*. *Nature* 164 (1949) 666.
3. Parkes, A.S., *Some biological effects of low temperatures*. *Advances in Science* 58 (1958) 1-8.
4. Hamilton, R., H.I. Holst, and H.B. Lehr, *Successful preservation of canine small intestine by freezing*. *Journal of surgical research* 14 (1973) 313-318.
5. Smith, A.U., *Revival of mammals from body temperatures below zero, in Biological Effects of Freezing and Supercooling*, A.U. Smith, Editor. 1961, Edward Arnold: London. p. 304-368.
6. Fahy, G.M., et al., *Vitrification as an approach to cryopreservation*. *Cryobiology* 21 (1984) 407-426.
7. Wowk, B. and G.M. Fahy, *Toward large organ vitrification: extremely low critical cooling and warming rates of M22 vitrification solution*. *Cryobiology* 51 (2005) 362.
8. Fahy, G.M., et al., *Cryopreservation of organs by vitrification: perspectives and recent advances*. *Cryobiology* 48 (2004) 157-178. ■

# Human Cryopreservation Stabilization Medications

By Aschwin de Wolf, Alcor Certified Technician

The goal of human cryopreservation standby and stabilization procedures is to preserve the structure and viability of the brain *after* medico-legal pronouncement of death. To achieve this goal we employ three different techniques: cardiopulmonary support (CPS), rapid induction of cooling (hypothermia), and pharmacological intervention.

The primary purpose of the medication protocol is to reduce or eliminate injury from cerebral ischemia. Ischemia is interruption of the delivery of adequate amounts of both oxygen and nutrients to the brain. The better we protect the brain from ischemic injury the better are the patient's chances of future revival. This brief introduction will familiarize the reader with the different classes of medications we use and some of the issues associated with administering them.

Although virtually all the medications ultimately are given to help mitigate ischemic injury, many of them are ethical pharmaceuticals with other uses in mainstream medicine. EMTs, paramedics and nurses therefore may be familiar with many of them. The most important differences are the number used, the different context and sometimes rationale of use, and different dosages than are common in orthodox medical practice.

The fairly large number and volume of the medications raise the obvious question of what the preferred sequence should be. The most important consideration is that the sequence should reflect medical priorities. For example, *diprivan* is administered as the first medication to reduce cerebral metabolic demand. The second consideration is to give the small volume medications first and the larger volume medications later so that most of the medications can be given in the shortest period of time. Naturally there can be a conflict between the two. When it's not desirable to delay the administration of a drug, a small portion of the total volume can be given rapidly and the rest can be administered (as a drip) later.

Although the medications currently used in human cryopreservation reflect years of experience and research, it needs to be stressed that this does not completely release the cryopreservation technician from using (medical) common sense. For example, considering the total volume of medications in our protocol, a normally hydrated infant may have different fluid (and medical) needs than a severely dehydrated large adult. A patient may have been already heavily pre-medicated with some of the medications in our protocol (*aspirin* for example). If manual chest compressions are *only* performed to *circulate* the medications without continuing CPS, it may be questionable to start an aggressive vasopressor protocol.

These kinds of issues stress the importance of comprehensive data collection, detailed reporting and systematic analysis. The more we learn about the different effects of our protocol in different situations, the better we may be able to refine it to suit a particular patient's needs. In this respect human cryopreservation is not unlike conventional medicine; one size *doesn't* fit all. ■



Aschwin de Wolf

Aschwin was born in Leiden, the Netherlands, and moved to the United States in 2000. He obtained his Masters degree in political science at the University of Amsterdam where his interest in methodology and economics culminated in a critical review of neo-classical theories of market failure.

The prominence of game theory and evolutionary psychology in the economic study of moral and political decision-making was a crucial factor in shifting his interests from the behavioral to the natural sciences over the years.

He joined the Alcor Life Extension Foundation in late 2002 after reading Max More's *The Terminus of the Self* appearing in *Cryonics* magazine (4<sup>th</sup> Qtr 1994, 1<sup>st</sup> Qtr 1995), and Eric Drexler's *Engines of Creation*. He has been an active member ever since, including participating on the Alcor emergency response team since March 2003. His interests range from economics, chemistry and molecular biology to avant-garde music, industrial photography and urban exploration / psycho-geography.

Aschwin is Procedures Development Director at Suspended Animation, Inc., a South Florida-based human cryopreservation research company and currently lives in West Palm Beach.



## Anesthetics

Although the human brain accounts for only 2% of total body mass it accounts for about 20% of total oxygen consumption (at rest). The first priority therefore is to reduce cerebral oxygen consumption to make the brain more tolerant to the limited blood flow CPS produces. This can be achieved by inducing deep anesthesia. Because we prefer to use medications that are not Schedule II regulated drugs and which also confer anti-ischemic benefits, the current anesthetic of choice is *diprivan* (*Propofol*). Naturally, this medication should be given just before, or *immediately* after, starting CPS. The choice of *diprivan* is a typical example of the sort of tradeoff that sometimes needs to be made in human cryopreservation. *Diprivan* decreases blood pressure which is undesirable in the context of trying to restore optimum cerebral blood flow.

**Use in Conventional Medicine:** *Propofol* is an intravenous agent used for induction of (surgical) anesthesia.



### Anticoagulants, Antiplatelets and Fibrinolytics

The formation of blood clots during human cryopreservation cases is problematic for a variety of reasons. It may frustrate our attempt to provide adequate CPS, cause serious problems during blood washout, or complicate perfusion with a vitrification solution (in cases without blood washout). Because anticoagulant and antiplatelet agents like *heparin* and *aspirin* only *prevent* blood clotting, a fibrinolytic, *streptokinase*, is given to dissolve existing blood clots. *Streptokinase* is an example of a slightly more challenging medication to administer because it is supplied as a powder that needs to be reconstituted with sodium chloride (saline) and filter sterilized prior to administration.

**Use in Conventional Medicine:** *Streptokinase* is used to *dissolve* blood clots in myocardial infarction (heart attack). *Heparin* is used to *inhibit* clot formation in cardiovascular disorders and pulmonary embolism (blockage of the artery carrying blood from the heart to the lungs).



### Vasopressors

In human cryopreservation vasopressors (pressors) are used to increase blood pressure and selectively shift blood flow to the vital organs (including the brain). The current vasopressors of choice are *epinephrine* and *vasopressin*. Because avoiding *some* of the side effects of these medications is not as high a priority in human cryopreservation as in conventional medicine, protocol and dosages may differ somewhat from current practice in cardiopulmonary resuscitation. It is hard to overestimate the importance of restoring adequate cerebral blood flow in the human cryopreservation patient. It is also important to note that epinephrine needs to be given intermittently at short intervals (or continuously infused) instead of administering just one single large bolus<sup>1</sup>. This is done because epinephrine has a short half-life and is rapidly metabolized. Ideally, cardiac output and oxygenation of the brain are measured to validate stabilization procedures in general, and to make informed decisions about the use of vasoactive medications, in particular.

**Use in Conventional Medicine:** *Epinephrine* is used as a vasopressor in cardiopulmonary resuscitation and anaphylactic shock (a sudden, severe allergic reaction). *Vasopressin* is used to treat septic shock (shock as a result of a serious infection) and is increasingly used as an alternative for epinephrine in cardiopulmonary resuscitation.



### Buffers

Although human blood normally has a pH of 7.4, which is kept in a very tight range in a healthy human being, after a (prolonged) period of ischemia, and/or inadequate circulation and ventilation, the typical patient becomes acidotic. This is a serious concern because this condition damages cells, accelerates blood clotting, induces clumping of red blood cells (agglutination) and exacerbates cold agglutination. Acidosis also renders *epinephrine* and *heparin* inactive because, as in the case of *epinephrine*, the drug is effective only within a certain pH range, or in the case of *heparin*, acidosis degrades the drug and inactivates it. To prevent and treat acidosis a buffer is given. The current buffer of choice in human cryopreservation is *tromethamine* (*THAM*) because it does not have some of the side effects (like cell swelling) of *sodium bicarbonate*. In the ideal human cryopreservation case pH is meticulously monitored and additional buffer is administered if acidosis is observed.

**Use in Conventional Medicine:** *Tromethamine* is used to treat metabolic acidosis when sodium bicarbonate cannot be used.



### Ischemia Treatment and Protection Agents

In the ideal case, circulation and ventilation are restored immediately after pronouncement of medico-legal death in conjunction with medications and (surface) cooling. Although this protocol is fairly aggressive compared to that which is usually employed by paramedics in out-of-the-hospital resuscitation from cardiac arrest, it is usually inadequate to meet the metabolic demands of the patient. This is especially the case if the patient has already experienced some ischemic injury prior to pronouncement and/or the standby team is not able to start the stabilization protocol immediately, or if the patient is febrile (feverish) at the time of pronouncement.

No (or inadequate) blood flow fails to provide (enough) energy to maintain ion gradients across cell membranes, leading to depolarization. The depolarization of presynaptic membranes overactivates the neurotransmitter glutamate, causing increased calcium ion ( $\text{Ca}^{++}$ ) influx. In the absence of adequate energy production excessive  $\text{Ca}^{++}$  leads to a cascade of damaging events including pathological activation of various enzymes, inflammatory mediators, generation of harmful free radicals and apoptosis (programmed cell death), leading to an explosive positive feedback-loop in which one event amplifies and accelerates others<sup>2</sup>.

The agents that are used in human cryopreservation to mitigate ischemic- and reperfusion injury (the largely free-radical induced damage caused by restoring circulation and ventilation) include a variety of antioxidants, excitotoxicity- and nitric oxide synthase- inhibitors to target different parts of the damaging cascade of events resulting from inadequate blood flow. This multi-modal approach in treating cerebral ischemia has been developed and proven to be effective in recovering dogs after 17 minutes of normothermic cardiac arrest at Critical Care Research, a California-based resuscitation research company.

A relatively recent addition to this multi-modal treatment of ischemia is a class of agents called PARP-inhibitors. The overactivation of the DNA repair enzyme poly (ADP-ribose) polymerase (PARP) during ischemia leads to a rapid depletion of the major energy sources of the cell. Studies of PARP-inhibitors in animal models and “knock-out” mice (mice with inactivated PARP genes) indicate the potential of PARP inhibition in mitigating cerebral ischemia. One advantage of PARP inhibitors is that PARP activation is a final common pathway in many of the events in the ischemic cascade, potentially offering a greater degree of protection and providing a longer window of opportunity in mitigating cerebral ischemia.

**Use in Conventional Medicine:** *4-Hydroxy-Tempo*, a free radical scavenger, is not administered in conventional medicine today but may be used for the treatment of acute stroke in conventional medicine if combination treatment becomes more popular.



### Volume Expanders and Oncotic Agents

As indicated above, intravenous access is not only necessary to administer medications but also to administer fluids to address electrolyte imbalances and replace volume (in the dehydrated patient). A fluid like *dextran-40* is not only a volume expander but also improves microcirculation and somewhat inhibits hypothermia induced cold agglutination (clumping of red blood cells due to low temperatures). Another agent employed in fluid management is *mannitol*. *Mannitol* has been proven effective in ischemia induced cerebral edema by promoting movement of fluid from the cells to the vascular space. Other advantages of mannitol are reduction of blood viscosity (improving perfusion) and its free radical scavenging properties. Both of these fluids are given in fairly large volumes (compared to most of the medications) so a basic understanding of fluid balance and electrolytes is desirable to make informed decisions for the patient.

**Use in Conventional Medicine:** *Mannitol* is used to reduce intracranial pressure, treat oliguric renal failure, and can open the blood brain barrier to deliver medications to the brain.

## References

- 1 Jakob Johansson (2004). *Cardiopulmonary Resuscitation: Pharmacological Interventions for Augmentation of Cerebral Blood Flow*, Dissertation, Uppsala University Sweden
- 2 Paul Morley, Joseph S. Tauskela, and Antoine M. Hakim (1999). “Calcium Overload” in *Cerebral Ischemia: Molecular and Cellular Pathophysiology* (ed. Wolfgang Walz), pp. 69-105

# Learn More Online

## Transporting Medications

Alcor has many members throughout the U.S. and the world. So, how does Alcor's emergency response team get the necessary medications to the patient for the first critical steps of a cryopreservation?

Full details are available online: [www.alcor.org/AtWork/p1field.html](http://www.alcor.org/AtWork/p1field.html)



**THOMAS PACK:** Alcor's standby and transport teams are equipped with medications for immediate use. Team members transport a full range of medications in a padded backpack of a type that is standard issue for paramedics nationwide.



**PACK MODULES:** The backpack opens to reveal padded, color-coded modules which can be rapidly removed. The backpack also has side compartments for medical equipment such as nitrile gloves and face masks. A separate yellow insulated meds pack (the yellow module in the background) fits in the center of the backpack.

### INJECTABLE MEDICATIONS:

The yellow insulated meds module opens to reveal injectable medications which are kept refrigerated prior to deployment.



# Tracking Caseload Trends

By R. Michael Perry, Ph.D.

*Editor's Note: In the past two months, Alcor's staff has embarked on an extensive three year planning process. This three year plan included careful evaluation of our current membership, services and facilities, as well as a conscientious look at the future in terms of all aspects of company operations. Primary to this planning process is careful consideration of how to provide the best possible care and attention to both our members and patients.*

*One element of the planning process was to scientifically evaluate possible scenarios of membership growth and the subsequent impact on performing cryopreservations. The following article is an abbreviated look at the mathematical evaluation of possible membership increases—and therefore cryopreservations. The author, Dr. R. Michael Perry, has a B.S. in mathematics and a Ph.D. in computer science.*

Alcor understands the importance of having the resources necessary to uphold its mission, both during normal operations and during times of unusual or peak demands. For a cryonics organization human cryopreservations are a lengthy, involved operation extending over several days and involving a considerable number of staff and volunteers. Each patient must be handled promptly to achieve the best possible cryopreservation. Unusual caseloads, for example, two or more cryopreservation cases that start within a 24-hour interval, will place extra demands on the system and facilities, and need to be anticipated. Thus we felt we could serve you better by taking the time to estimate the likelihood of such possibilities as well as the more usual, expected demands we may face.

Based on Alcor's current membership base of about 800 people and standard mortality tables, there is an estimated (mean) caseload of about 6.5 cryopreservation cases per year. The lowest number of cases likely to occur is 4 and the most is 8. (This interval covers approximately

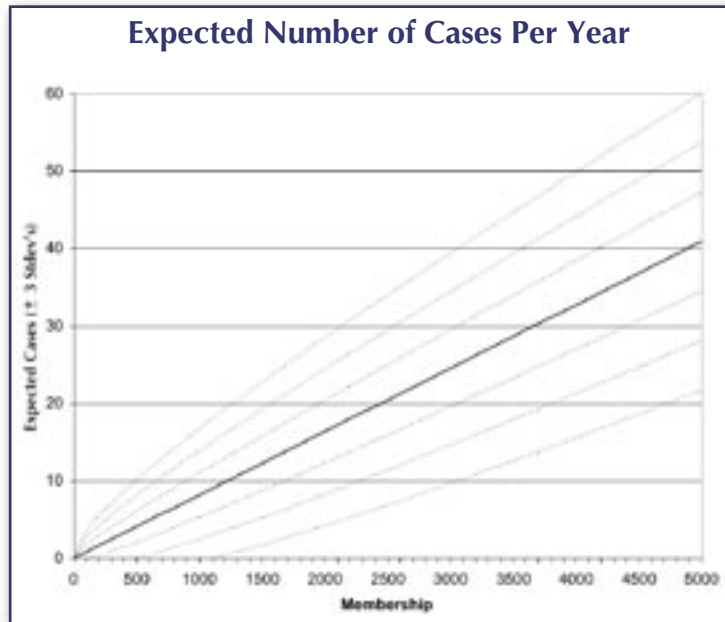
one standard deviation from the mean or what happens about two thirds of time.) Alcor certainly has the capability to handle this. In the past, Alcor has been faced with the possibility of no cases in a given year,

which impacted cash flow. Today, we are almost guaranteed that will not be an issue.

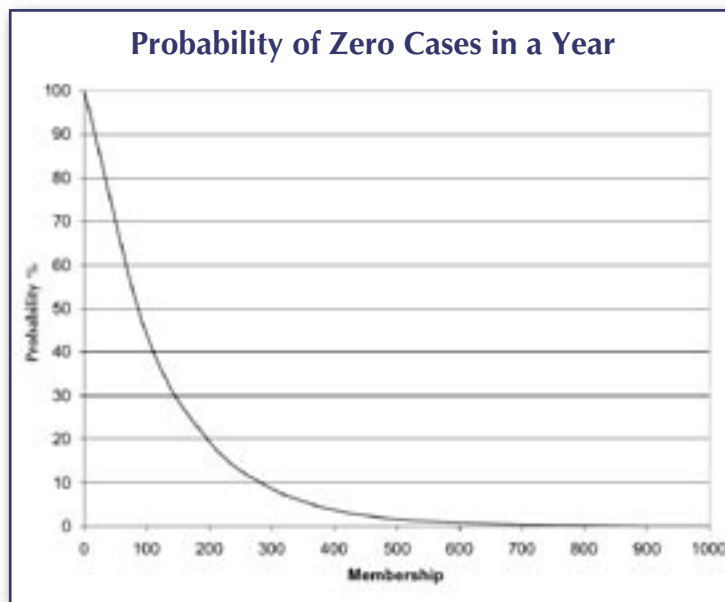
But, the ability to handle multiple cases simultaneously may soon be a requirement. So, how likely is it that a multiple case—two or more cryopreservations—will happen within 24 hours of one another? Our calculations indicate there is a 5.46 percent chance of it happening each year. That being true, multiple cases will only happen once every 17 years on average. As illustrated by these graphs, there is a far greater chance of two simultaneous cryopreservations than three. Realistically, it appears that as of today multiple cases within 24 hours have not been reported by any single cryonics facility or organization. There have been near-misses as was seen at Alcor last October when two cases happened less than three days apart.

Thus far we have assumed that all events are independent. Experience has shown this is a reasonable assumption, though certainly it is possible for dependencies to occur—multiple cryopreservations resulting from a single accident, for instance. Such exceptional occurrences have so far not been reported in the cryonics field. Eventually, one could expect two or more such events to occur or commence in a short timeframe, thus obviating the presently assumed independence. However, this prospect should remain insignificant with a membership population near current levels.

But what if Alcor were to double its membership? Well, we know that doubling the membership would result in a doubling of the annual caseload. Thus, with 1600 members, there would be about 13 cryopreservations each year. In turn, this would increase the per-annum likelihood of a multiple cryopreservation by nearly a fac-



This graph shows the expected range of annual cases as Alcor's membership grows. At 800 members, the expected caseload is approximately 6-7 cryopreservation cases per year.

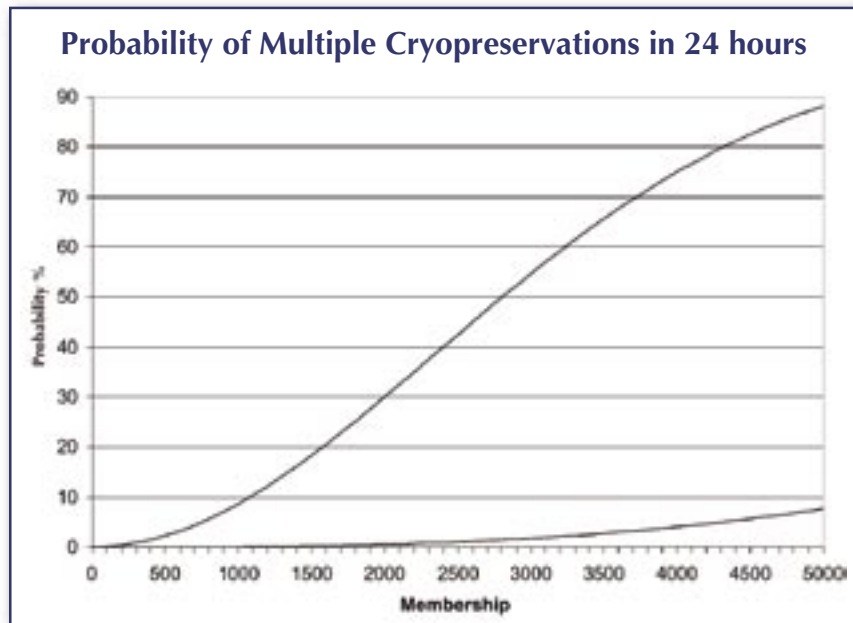


This graph shows that Alcor is nearly guaranteed to have at least one case every year. Knowing this helps the organization project its expected expenses and income.

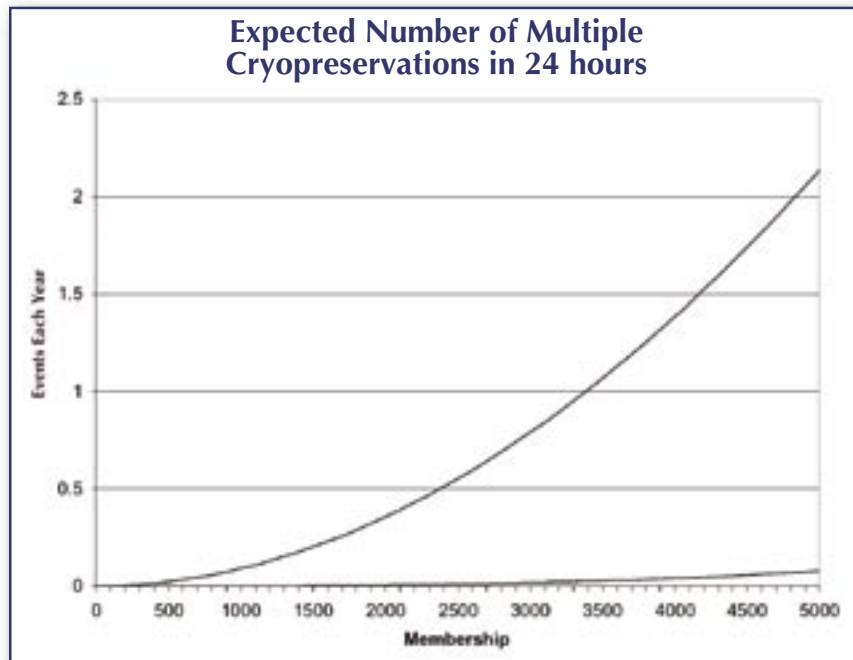
tor of four. Such an event would now be expected about every 4.4 years, as opposed to every 17 years. Rest assured, we have time to prepare. At present growth rates, Alcor will not face a doubling of its membership until the year 2021, another 15 years. ■

Contact the author: [mike@alcor.org](mailto:mike@alcor.org)

## New Patient Care Bay



The upper line shows the probability of occurrence, within a year, of two or more cryopreservations starting within a 24-hour interval of one another. The lower line shows the probability of three or more cryopreservations happening. The increasing importance of being prepared to take on multiple cases simultaneously motivated our decision to build an expanded operating suite.



The upper line shows the expected number of times per year that two or more cryopreservations will start within a 24-hour period. The lower line shows how many times per year three or more cryopreservations will occur. Our present ability to perform two simultaneous cryopreservations should be sufficient to meet the membership's needs well into the future.

After literally years of effort, finally everything was in readiness and our patients were moved into a new, much roomier location in Alcor's headquarters on April 19, 2006. Some half-dozen 5,700-lb Bigfoot dewars were gently hoisted by crane and forklift and deposited in their new location, the 1500 square foot Patient Care Bay. The move was completed in about two hours and all our patients are safely placed in the new location. The new Patient Care Bay will allow us to care for at least 225 patients.

Figures as of June 1, 2006

Country	Members	Applicants	Patients	Subscribers
Argentina	0	1	0	1
Australia	9	3	2	0
Austria	0	0	0	1
Canada	30	6	1	4
France	0	0	0	1
Germany	3	0	0	1
Ghana	0	1	0	0
Israel	0	0	1	0
Italy	0	3	0	2
Luxemburg	0	1	0	0
Mexico	2	0	0	0
Monaco	2	0	0	0
Netherlands	2	1	0	0
Spain	0	1	0	0
Sweden	0	0	0	1
Switzerland	1	1	0	1
Thailand	1	0	0	0
U.K.	18	7	1	1
USA	727	59	69	101
<b>Totals</b>	<b>795</b>	<b>84</b>	<b>74</b>	<b>114</b>



# MEMBER PROFILE: BETH BAILEY

## How did you first learn about Cryonics?

I first heard about cryonics on television in a program including comments by scientists. The anti-cryonics position was that the procedure won't work because of ice crystal damage to cells, and "believing cryonics could reanimate somebody who has been frozen is like believing you can turn hamburger back into a cow." However, I chose to bet on the pro-cryonics scientist who envisioned future technology that will improve cryopreservation and correct ice crystal damage.

## When did you join Alcor and what motivated you to become a member?

I joined in July of 2004. I began to research cryonics on the Internet, and that led me to Alcor. I was motivated to sign up because I would take any chance to see and experience living in the future. My greatest hope is that I will be around when commercial space travel becomes as common as jet travel is now.

## How does your membership impact your life plans or lifestyle?

Because I joined Alcor, my husband and I chose to take our summer vacation in Arizona. It was wonderful. We got to spend the night at the Grand Canyon, took a float trip at the Glen Canyon River Dam, went to the Lowell Observatory (where Pluto was discovered), visited lots of ruins, meteor crater, Frank Lloyd Wright's Taliesin West, and even managed to squeeze in two Diamondbacks baseball games. Arizona is a beautiful state. Although, August is a bit hot, and nobody prepared us for the monsoons!



Beth with her husband Tom, on vacation in Arizona

## What do you consider the most challenging aspect(s) of cryonics?

First, the sociological task of trying to gain increased acceptance for cryonics and second, promoting the scientific research necessary to develop technologies that will optimize cryopreservation and someday revive suspendees. These are complex areas that will

require all the skills, talents, and abilities cryonicists can bring to bear. However, every achievement humankind has ever made began as a visionary idea worth believing in and fighting for.

America did not get to the moon until President Kennedy told us, "We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too." Apollo 11 successfully completed the first manned lunar landing on July 20, 1969.

## Have you met a lot of other Alcor members?

I got to meet Hugh Hixon and Steve Van Sickle when my husband and I toured Alcor. During my Alcor sign up process, I spoke to insurance agent Rudi Hoffman on the telephone.

## What areas of Alcor's program would you like to see developed over the next 5-10 years?

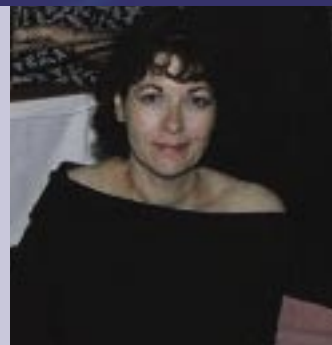
In certain states, nurses require continuing education credits (CEU's) to maintain their license or to seek career advancement. Some of these classes are offered over the Internet. I would like to see Alcor develop a written class for nurses and allied health professionals. This would be a win-win situation. An accredited class will grant recognized CEU's, while helping to educate the public about cryonics. Perhaps someone at Alcor could write an interesting article and related quiz. Alcor could then partner with an accredited provider to offer the class online.

## What kind of lasting contribution would you like to make to cryonics?

I want to help make cryonics more acceptable to the general public.

## What do your friends and family members think about your cryopreservation arrangements?

My husband is very supportive, although I am still trying to convince him to sign up with Alcor. The rest of my family is on a continuum of "if this is what you want we will respect your wishes" to total denial. I also get to hear lots of "head in a jar" jokes like,



Beth Bailey

Beth owns and runs iBuys.com Thermometers & Test Strips. She has a BA in psychology and a BS in nursing. Her nursing experience includes labor and delivery, as well as gerontology. Beth's experiences have given her a unique perspective on the value of life at any age and fostered her belief that "each day is a gift, and we have the responsibility of living to our full potential." Beth and her husband have been happily married for 16 years. *Contact Beth at: sales@ibuys.com*

"Why go to Alcor? We have plenty of room in our freezer at home."

## What are your hobbies or special interests?

I love rock music. My mother took me to see the Beatles at Shea Stadium in 1967. Since that time I have had the privilege of seeing many of my favorite bands, such as the Ramones and Green Day. I also love to read science fiction.



Beth with her husband, Tom

## What would you like to say to other members reading this interview?

At this time, cryonics "is the second worst thing that can happen to you." If your remains are buried or cremated, you have no chance of being revived, but if you are rapidly placed in cryopreservation while your mind remains intact, science and technology may progress to the point where your body can be healed or replaced. For most people this is the realm of science fiction. It is up to us to help people understand that cryonics is an idea whose time has come. ■

# Case Summary Cryopreservation of A-1097

By Tanya Jones

## Background

A long-time cryonicist, member A-1097 joined Alcor in October 1985. In 1988, he was diagnosed with a Grade II astrocytoma (brain tumor). Remission of the cancer was sustained until 2003, when his tumor reoccurred as a Grade IV astrocytoma. As he was being treated for this more serious form of his cancer, he underwent an astonishing 42 cycles of chemotherapy.

This member was a resident of northern California until moving to Australia in recent years. We checked on his progress periodically but did not hear anything other than, "he's still receiving treatment," until December 26, 2005. He had been admitted to an Australian hospital with pneumonia and his family requested assistance in moving him to Arizona for terminal care. Within a few days after entering the hospital, he was well enough to speak (and annoy his nurses). His desire for independence was evident, and it was considered a good sign.

Recovered enough to travel, the member made the trip to Los Angeles in early January 2006. Medical personnel and his power of attorney accompanied him from Australia and were met by a member of the Alcor team. He was then flown to a hospice in Phoenix. He did extremely well throughout his journey and never

once needed supplemental oxygen. This was a sign that his troubles with pneumonia were over.

His cancer, however, was a different matter. When the member was admitted to hospice in Phoenix, he was somewhat confused and unable to communicate. This member had been a friend to many of the Alcor staff for years, and staff and friends took turns visiting him.

## Standby & Stabilization

Alcor staff performed 24-hour observation of the patient's condition starting on January 14 and was on hand until the member's pronouncement of legal death on January 19, 2006, at 08:37 am. Within minutes, Alcor had circulated the first three stabilization medications and prepared to administer oxygen. In less than 20 minutes, the patient had been surrounded with ice, an IV had been placed, mechanical chest compressions were started, and the patient was being transported to Alcor in the emergency transport vehicle.

## Transport

During the 40-minute drive to Alcor, the rest of the stabilization medications were admin-



istered and the patient was completely covered with ice (from the ice machine on-board our emergency transport vehicle). His temperature dropped markedly during this time. Upon arrival at Alcor, his nasopharyngeal temperature had dropped to 25 °C. Note: This highlighted the effectiveness of both larger volumes of ice and the mechanical cardiopulmonary support device, which enabled faster circulation. Larger amounts of ice will be used in future transports, where possible.

Prior to starting the cryoprotection, staff attempted to dramatically lower the brain temperature quickly to prevent some of the ischemic damage that results from the length of time for surgery. However, this experimental protocol proved too slow and staff immediately reverted to the standard protocol.

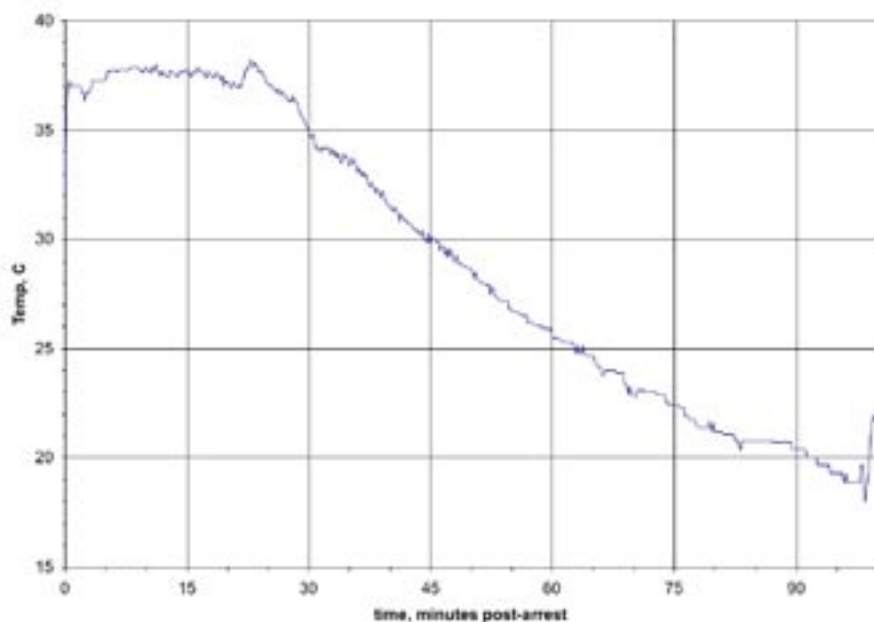
## Washout

Less than two hours after cardiac arrest blood washout began. Because of the rapid response and quality of the stabilization, staff continued oxygenation throughout the cryoprotection (started after the washout). Alcor staff noted good perfusion of the patient, as well as signs of cryoprotectant uptake almost immediately upon beginning the cryoprotection.

## Cryoprotection

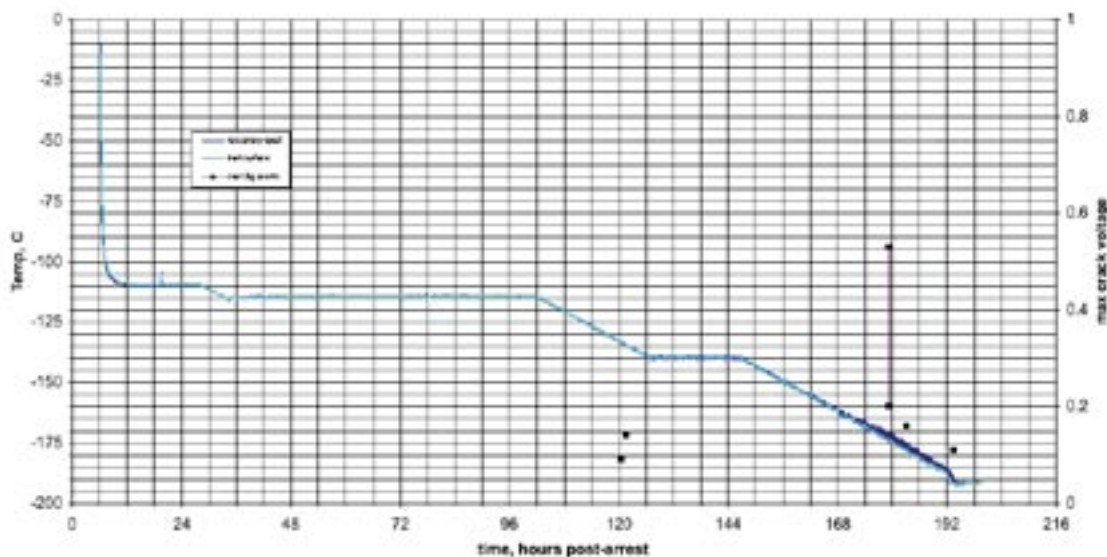
Somewhat contrary to expectations, the brain tumor was not causing problems to circulation. Unlike many previous cases, both hemispheres of the brain responded in remarkably equal fashion to the introduction of cryoprotectant. Target concentrations were achieved, and there was no sign of any negative physiological response to the procedure.

Transport Temperature (nasopharyngeal)



Graph shows temperature from cardiac arrest until shortly after arrival at Alcor. CPS plus ice bath cooling began approximately 23 minutes post arrest and dropped the patient's nasopharyngeal (nasal) temperature to 18 °C in 75 minutes.

## A-1097 Cooldown and Acoustic Monitoring



Graph shows cooldown and fracturing events. The patient was plunged to  $-110^{\circ}\text{C}$  to minimize cryoprotectant toxicity, then cooled slowly to  $\text{LN}^2$  temperature. An unusual, double fracture event was observed at approximately  $-174^{\circ}\text{C}$ .

### Cooling

First-stage cooling (a plunge to  $-110^{\circ}\text{C}$ ) began almost exactly six hours after cardiac arrest. The patient reached that temperature within 12 hours, and second-stage, slower cooling began at the usual rate of  $1^{\circ}\text{C}$  per hour. Six fracture events were detected, with the first occurring at  $-133.6^{\circ}\text{C}$ . All were of small amplitudes, consistent with the results seen in both B2C (our old neurovitrification cryoprotectant) and M22 (the new one). Cooling was completed on January 27, 2006, and the patient transferred to long-term patient care on February 2.

### Staff Observations

This was one of the smoothest cryoprotectations Alcor has ever performed. The high quality of this case was almost entirely due to the member relocating close to Alcor, which was the result of hard work by his family. Without this, his care would have been vastly different due to the great distance between his home in Australia and Alcor headquarters.

Another factor in the success of this case involved the use of some new equipment that worked well, including the sternal intraosseous IV access port, a mechanical ventilator, and a respiratory impedance device. A new monitoring unit to watch oxygen levels told us when our oxygen cylinder was losing pressure and needed to be changed. All medications, save crystallized mannitol, were administered in full. Placing the endotracheal tube went well and was done

quickly after the Combi-tube proved unsuccessful. The Alcor staff collected stabilization notes, despite having a limited, three-person team.

Deployment of the Squid, a device that circulates cold water over the patient to accelerate surface cooling, was a success. Alcor's new monitoring equipment suffered a carbon dioxide sensor failure which indicates the need to adjust the settings to accommodate Alcor's unusual requirements for future cases. Another issue for further study involved unreliable preliminary temperature data, resulting from two probes, placed nasopharyngeally, which gave different readings.

This case also highlighted the need for more local team support. The recent addition of two EMTs and one respiratory therapist to Alcor's list of local, trained individuals is a partial solution to this problem.

Alcor continues work on facility renovations which, when complete, will ensure that the emergency transport vehicle can be housed inside the Alcor building and ready to go at a moment's notice.

Overall, the quality of care this patient received was outstanding, as he became Alcor's 73<sup>rd</sup> patient. ■

Contact the author: [tanya@alcor.org](mailto:tanya@alcor.org)



## Doctors Claim Suspended Animation Success

Researchers are testing potentially life-saving techniques for keeping humans in a state of suspended animation while surgeons repair their wounds. US doctors are trying to develop a method of inducing hypothermia to shut down the body's functions for up to three hours. In tests, they reduced the body temperature of injured pigs from 37°C to 10°C before operating on them and then reviving them. Now they are applying for permission to test the procedure on casualty patients without a pulse who have lost large amounts of blood.

*The Sydney Morning Herald* - 1/20/06  
[www.smh.com.au/articles/2006/01/20/1137553739997.html](http://www.smh.com.au/articles/2006/01/20/1137553739997.html)

## Stretchable Silicon Could Be Next Wave In Electronics

Researchers at the University of Illinois at Urbana-Champaign have developed a fully stretchable form of single-crystal silicon with micron-sized, wave-like geometries that can be used to build high-performance electronic devices on rubber substrates. "Stretchable silicon offers different capabilities than can be achieved with standard silicon chips," said John Rogers, a professor of materials science and engineering and co-author of a paper to appear in the journal



A silicon wafer begins in the process of microchip fabrication

*Science*, as part of the Science Express Web site, on Dec 15. Functional, stretchable and bendable

electronics could be used in applications such as sensors and drive electronics for integration into artificial muscles or biological tissues, structural monitors wrapped around aircraft wings, and conformable skins for integrated robotic sensors, said Rogers.

BBC News - 12/16/05  
[www.sciencedaily.com/releases/2005/12/051215230914.htm](http://www.sciencedaily.com/releases/2005/12/051215230914.htm)

## Quantum Computing Progress

Quantum computing relies on information being stored in quantum bits, or qubits, which can exist in two states at once and could therefore do multiple calculations simultaneously. Researchers have already created particles in which one or two properties such as energy or momentum are entangled. Now Paul Kwiat and his colleagues at the University of Illinois at Urbana-Champaign have created the first ever hyper-entangled particles—pairs of photons for which every possible quantum property is entangled. These hyper-entangled states could make it possible to store multiple qubits on the same photon, reducing the number of photons required and making the system easier to manipulate. Their work will be published in *Physical Review Letters*.

*New Scientist* - 1/7/06  
[www.newscientist.com/channel/info-tech/mg18925334.900.html](http://www.newscientist.com/channel/info-tech/mg18925334.900.html)

## Scientist's Embryo Cloning Faked

An investigation into the work of discredited South Korean cloning scientist Hwang Woo-suk has found further fabrications in his research. His 2004 landmark claim to have taken stem cells from a cloned human embryo was false, a panel has concluded. But the investigators, who rejected other research by the scientist, have accepted that he did create the world's first cloned dog. Dr. Hwang has admitted errors, but claims his work was sabotaged. State prosecutors are now expected to look into the case.

BBC News - 1/11/06  
<http://news.bbc.co.uk/1/hi/world/asia-pacific/4597416.stm>

## Dexterous Mini-Robots to Aid Surgeons

Scientists are developing a new generation of dexterous mini-robots for use in minimally invasive surgery. *New Scientist* magazine reports that several prototypes of the radio-controlled robots are being tested in animal models. They have been used to help perform gall bladder and prostate removal in pig experiments. The University of Nebraska team, headed by Dr. Dmitry Oleynikov who invented the robots, believe they could potentially revolutionize minimally invasive surgery.

BBC News - 1/26/06  
<http://news.bbc.co.uk/1/hi/health/4647258.stm>

## Fastest View of Molecular Motion

Scientists have made the fastest ever observations of motion in a molecule. They "watched" parts of a molecule moving on an attosecond timescale—where one attosecond equals one billion-billionth of a second. The researchers say the study gives a new in-depth understanding of chemical processes and could be used in future technologies like quantum computing. The study, which relies on short pulses of light from a specially built laser, was published in the journal *Science*.

BBC News - 3/4/06  
<http://news.bbc.co.uk/1/hi/sci/tech/4766842.stm>

## Immune Cells May Help Maintain Cognition and Brain Cell Renewal

A team of scientists at the Weizmann Institute of Science, led by Prof. Michal Schwartz of the Neurobiology Department, has come up with new findings that may have implications in delaying and slowing down cognitive deterioration in old age. The basis for these developments is Schwartz's team's observations, published today in the February issue of *Nature Neuroscience*, that immune cells help the brain maintain its cognitive ability and cell renewal throughout life.

ScienceDaily - 1/16/06  
[www.sciencedaily.com/releases/2006/01/060115153751.htm](http://www.sciencedaily.com/releases/2006/01/060115153751.htm)

## Fund Your Cryonic Cryopreservation Affordably with Life Insurance



### Rudi Hoffman

Certified Financial Planner™  
Chartered Life Underwriter

**Cryonics Insurance Specialist,**  
Investments, Financial Services,  
Annuities  
Licensed in 23 states

For a FREE QUOTE  
call toll free or complete form at:  
[www.rudihoffman.com](http://www.rudihoffman.com)  
800-749-3773  
[rudicfp@aol.com](mailto:rudicfp@aol.com)

## Update your wardrobe today!

**Alcor has merchandise available featuring the Alcor logo!**

To order: Call 480.905.1906 ext. 101

T-shirts (short sleeve) ..... \$10

T-shirts (long sleeve) ..... \$15

All shirts available in small, medium, large, XL, and XXL White, black, or blue

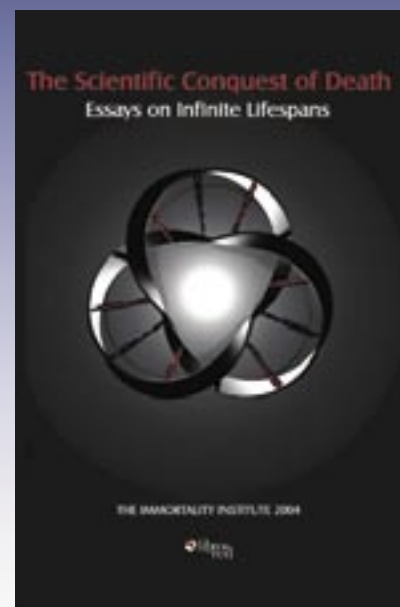


## Your Ad Here

Advertising inquiries:  
480.905.1906 ext. 113

*The Society for  
Venturism*  
promotes immortalist  
philosophy.  
Visit our web site at  
[www.venturist.org](http://www.venturist.org)

## FREE ONLINE BOOK & DOCUMENTARY IMMORTALITY INSTITUTE



# MEETINGS

## About the Alcor Foundation

The Alcor Life Extension Foundation is a nonprofit tax-exempt scientific and educational organization dedicated to advancing the science of cryopreservation and promoting it as a rational option. Being an Alcor member means knowing that—should the worst happen—Alcor's Emergency Response Team is ready to respond for you, 24 hours a day, 365 days a year.

Alcor's Emergency Response capability includes specially trained technicians and customized equipment in Arizona, northern California, southern California, and south Florida, as well as many additional certified technicians on-call around the United States. Alcor's Arizona facility includes a full-time staff, the Patient Care Bay is personally monitored 24 hours a day.

## ARIZONA

### Scottsdale:

Alcor Board of Directors Meetings—Alcor business meetings are generally held on the first Saturday of every month starting at 11:00 am MST. Guests are welcome. For more information, contact Alcor at (480) 905-1906.

### Scottsdale/Phoenix:

#### Alcor Tours

Tours are held at Alcor at 10:00 am and 2:00 pm every Tuesday and Friday. Call Alcor (877) 462-5267 ext. 101 to schedule an appointment or email [dbora@alcor.org](mailto:dbora@alcor.org).

## NEVADA

### Las Vegas:

There are many Alcor members in the Las Vegas area. If you wish to meet and socialize, contact Katie Kars at (702) 251-1975. This group wants to get to know you!

## CALIFORNIA

### Los Angeles:

Alcor Southern California Meetings—For information, call Peter Voss at (310) 822-4533 or e-mail him at [peter@optimal.org](mailto:peter@optimal.org). Although monthly meetings are not held regularly, you can meet Los Angeles Alcor members by contacting Peter.

### San Francisco Bay:

Alcor Northern California Meetings are held quarterly in January, April, July, and October. A CryoFeast is held once a year. For information on Northern California meetings, call Marek (Mark) Galecki at (408)245-4928 or email [Mark\\_galeck@pacbell.net](mailto:Mark_galeck@pacbell.net).

## WASHINGTON

### Seattle:

For information on Northwest meetings, call Richard Gillman at (425) 641-5136 or join the e-mail group CryonicsNW at <http://groups.yahoo.com/group/CryonicsNW>

## DISTRICT OF COLUMBIA

Life Extension Society, Inc. is a cryonics and life extension group with members from Washington, D.C., Virginia, and Maryland. Meetings are held monthly. Contact Secretary Keith Lynch at [kfl@keithlynch.net](mailto:kfl@keithlynch.net). For information on LES, see our web site at [www.keithlynch.net/les](http://www.keithlynch.net/les)

## MASSACHUSETTS

### Boston:

A cryonics discussion group meets the second Sunday of each month. For more information, contact David Greenstein at (508) 879-3234, e-mail: [davidsgreenstein@juno.com](mailto:davidsgreenstein@juno.com).

## TEXAS

### Dallas:

North Texas Cryonauts, please sign up for our announcements list for meetings (<http://groups.yahoo.com/group/cryonauts-announce>) or contact David Wallace Croft at (214) 636-3790 for details of upcoming meetings.

## UNITED KINGDOM

There is an Alcor chapter in England. Its members are working diligently to build solid emergency response, transport, and cryopreservation capability. For information about meetings, contact Andrew Clifford at [andrew@banknotes.ws](mailto:andrew@banknotes.ws). See the web site at [www.alcor-uk.org](http://www.alcor-uk.org).

## Host a Meeting in your area.

If you are interested in hosting regular meetings in your area, contact Alcor at 877-462-5267 ext. 113. Meetings are a great way to learn about cryonics, meet others with similar interests, and introduce your friends and family to Alcor members!

## WHAT IS CRYONICS?

---

Cryonics is an attempt to preserve and protect the gift of human life, not reverse death. It is the speculative practice of using extreme cold to preserve the life of a person who can no longer be supported by today's medicine. Will future medicine, including mature nanotechnology, have the ability to heal at the cellular and molecular levels? Can cryonics successfully carry the cryopreserved person forward through time, for however many decades or centuries might be necessary, until the cryopreservation process can be reversed and the person restored to full health? While cryonics may sound like science fiction, there is a basis for it in real science. The complete scientific story of cryonics is seldom told in media reports, leaving cryonics widely misunderstood. We invite you to reach your own conclusions.

## HOW DO I FIND OUT MORE?

---

The Alcor Life Extension Foundation is the world leader in cryonics research and technology. Alcor is a non-profit organization located in Scottsdale, Arizona, founded in 1972. Our website, [www.alcor.org](http://www.alcor.org) is one of the best sources of detailed introductory information about Alcor and cryonic suspension. We also invite you to request our **FREE** information package on the "Free Information" section of our website. It includes:

- A 30-minute DVD documentary "The Limitless Future"
- A fully illustrated color brochure
- A sample of our magazine
- An application for membership and brochure explaining how to join
- And more!

**Your free package should arrive in 1-2 weeks.**

(The complete package will be sent free in the U.S., Canada, and the United Kingdom.)

## HOW DO I ENROLL?

---

Signing up for a cryopreservation is easy!

**Step 1:** Fill out an application and submit it with your \$150 application fee.

**Step 2:** You will then be sent a set of contracts to review and sign.

**Step 3:** Fund your cryopreservation. While most people use life insurance to fund their cryopreservation, cash prepayment is also accepted. Alcor's Membership Coordinator can provide you with a list of insurance agents familiar with satisfying Alcor's current funding requirements.

**Finally:** After enrolling, you will wear emergency alert tags or carry a special card in your wallet. This is your confirmation that Alcor will respond immediately to an emergency call on your behalf.

**Call toll-free today to start your application:**

**877-462-5267 ext. 132**

**[info@alcor.org](mailto:info@alcor.org)**

**[www.alcor.org](http://www.alcor.org)**



**The Limitless Future**  
Get your FREE copy of Alcor's  
30-minute DVD documentary by visiting the  
"Free Information" section of our website





# Will You Be Alive and Healthy 10...20...30 Years from now?

Your best chance at achieving future immortality is to protect your precious health now so you can benefit from future medical breakthroughs. Staying informed about the latest health discoveries can mean the difference between life and premature death.

And the **Life Extension Foundation** can be your passport to the future. As the largest anti-aging organization in the world, we are dedicated to finding scientific ways to prevent disease, slow aging, and eventually stop death.

For more than two decades, Life Extension has been at the forefront of the movement to support revolutionary anti-aging research that is taking us closer to our goal of extending the healthy human life span indefinitely. We inform our members about path-breaking therapies to help keep them healthy and alive.

## Join today and you'll receive these life-prolonging benefits:

- **A subscription to *Life Extension* magazine** (\$59.88 yearly newsstand value)...Over 100 full-color pages every month are filled with medical research findings, scientific reports, and practical guidance about using diet, nutrients, hormones, and drugs to prevent disease and slow aging.
- Access to a toll-free phone line to speak with **knowledgeable health advisors**, including naturopathic doctors, nutritionists, and a cancer expert, about your individual health concerns. You can also receive help in developing your own personal life extension program.
- **Discounts on prescription drugs, blood tests, and pharmaceutical quality supplements** that will greatly exceed

your membership dues. You'll receive a directory listing the latest vitamins and supplements, backed by scientific research and available through a unique buyers club.

## FREE BONUS!

- ***Disease Prevention and Treatment* book** (\$49.95 cover price) ...this hardbound fourth edition provides novel information on complementary therapies for 133 diseases and illnesses—from Alzheimer's disease to cancer, from arthritis to heart disease—that is based on thousands of scientific studies.

Life Extension Foundation funds advanced vitrification and gene-chip research. Your \$75 membership fee helps support scientific projects that could literally save your life.

**Call 1-866-820-4967 today.**

**LIVE**  
Healthier & Longer

**LifeExtension**<sup>SM</sup>  
FOUNDATION

**Join today. Call toll-free 1-866-820-4967. Or visit [www.lef.org/pim](http://www.lef.org/pim)**